What is claimed is:

1. A motor power supply comprising:

a DC-conversion part which converts AC power from an AC power input part into DC power;

an inrush current limiting resistance provided between the AC power input and the DC-conversion part;

an overvoltage-protection switching part provided between the inrush current limiting resistance and the DC-conversion part;

a sensor which senses an output voltage of the DC-conversion part; and

a controller which switches the overvoltage-protection switching part On/Off to return energy stored in the DC-conversion part to the AC power input part through the inrush current limiting resistance when the output voltage of to the DC-conversion part is higher than a predetermined voltage.

2. The motor power supply according to claim 1, wherein:

the DC-conversion part comprises a pair of capacitors which are respectively charged with positive and negative voltages from the AC power.

3. The motor power supply according to claim 2, wherein:

the overvoltage-protection switching part comprises a pair of field effect transistors.

4. The motor power supply according to claim 3, wherein:

the controller switches On/Off the overvoltage-protection switching part to discharge at least one of the capacitors when the output voltage reaches a predetermined overvoltage limit.

5. The motor power supply according to claim 4, wherein:

the sensor comprises a comparator which determines whether the output voltage reaches the predetermined overvoltage limit.

6. The motor power supply according to claim 5, further comprising:

a relay which selectively bypasses the limiting resistance.

7. The motor power supply according to claim 5, wherein the controller switches the relay to bypass the resistance when the output voltage reaches a predetermined voltage

value, and switches the relay so that the resistance is not bypassed when the output voltage reaches the predetermined overvoltage limit.

8. A method of controlling a motor power supply comprising an AC power input part, a DC-conversion part which converts AC power from the AC power input part into DC power, an inrush current limiting resistance provided between the AC power input part and the DC-conversion part, and an overvoltage-protection switching part connected with the DC-conversion part in parallel, the method comprising:

charging the DC-conversion part when power is initially supplied via the inrush current limiting resistance;

sensing a voltage charged in the DC-conversion part; and

switching the overvoltage-protection switching part alternately On/Off when the sensed voltage is higher than a first predetermined voltage value, to reduce the voltage charged in the DC-conversion part by returning energy stored in the DC-conversion part toward the AC power input part.

9. The method according to claim 8, wherein:

the motor power supply further comprises a relay which selectively bypasses the inrush current limiting resistance, and

the method further comprises:

bypassing the inrush current limiting resistance when the voltage charged in the DC-conversion part reaches a second predetermined voltage value, so that the AC power input part and the DC-conversion part are directly connected.

10. The method according to claim 9, further comprising:

stopping the bypassing of the current limiting resistance when the voltage charged in the DC-conversion part is greater than the first predetermined voltage value.

11. The method according to claim 9, further comprising:

stopping the bypassing of the current limiting resistance when the voltage charged in the DC-conversion part is less than the second predetermined voltage value.

12. The method according to claim 8, wherein the switching of the overvoltage-protection switching part alternately On/Off comprises:

switching the overvoltage-overvoltage protection switching part On, where the voltage charged in the DC-conversion part becomes greater than a second predetermined value;

and

switching the overvoltage-overvoltage protection switching part OFF, where the voltage charged in the DC-conversion part becomes less than the first predetermined value.

13. The method according to claim 10, wherein the switching of the overvoltage-protection switching part alternately On/Off comprises:

switching the overvoltage-overvoltage protection switching part On, where the voltage charged in the DC-conversion part becomes greater than a second predetermined value; and

switching the overvoltage-overvoltage protection switching part OFF, where the voltage charged in the DC-conversion part becomes less than the first predetermined value.

14. A motor power supply for supplying an AC motor with power provided from an AC power source through an inverter, the motor power supply comprising:

a DC conversion circuit which converts power from the AC power source to DC power and outputs the DC power to the inverter;

a sensor which senses a voltage at an output of the DC conversion circuit;

an overvoltage protection circuit which returns energy from the DC conversion circuit to the AC power source if the sensed output voltage exceeds a first predetermined value.

15. The motor power supply according to claim 14, further comprising:

a controller which controls the overvoltage protection circuit in response to the sensed voltage.

16. The motor power supply according to claim 15, wherein:

the overvoltage protection circuit comprises at least one switch which selectively forms a current path between the output of the DC conversion circuit and the AC current source; and

the controller switches the at least one switch synchronously with a phase of the AC power source to return the energy from the DC conversion circuit to the AC power source.

17. The motor power supply according to claim 16, wherein the at least one switch is a field effect transistor (FET).

18. The motor power supply according to claim 17, wherein a diode formed integrally with the FET forms a part of the DC conversion circuit.

19. The motor power supply according to claim 14, wherein:

the DC conversion circuit comprises a capacitance circuit which stores the energy;

the overvoltage protection circuit comprises first and second switches, the first switch selectively forming a first current path between a first end of the capacitance and the AC current source and the second switch selectively forming a current path between a second end of the capacitance and the current source; and

the controller switches the first and second switches synchronously with the AC power source to return the energy from the DC conversion circuit to the AC power source.

20. The motor power supply according to claim 19, wherein:

the AC power source comprises outputs L1 and L2;

the controller switches the first switch where a voltage at L1 is greater than a voltage at L2 and switches the second switch where the voltage at L2 is greater that the voltage at L1.

21. The motor power supply according to claim 14, wherein:

the motor power supply further comprises:

a resistance selectively connectable between the AC power source and the DC conversion circuit, and

a controller; and

the overvoltage protection circuit comprises at least one switch which selectively forms a current path between the output of the DC conversion circuit and the AC current source;

wherein, the controller:

switches the at least one switch synchronously with a phase of the AC power source to return the energy from the DC conversion circuit to the AC power source, and

controls the resistance to be connected between the AC power source and the DC conversion circuit where the output voltage is less than a second predetermined value or greater than the first predetermined value.